

1. Use finite differences to calculate the eigenvalues and eigenvectors (wavefunctions) for the electron in the harmonic oscillator potential. Plot the particle probability densities of the 3 lowest states ($n=0,1,2$) and compare the analytic eigenvalues to the calculated results for $n<10$. Reproduce the comparison between the harmonic oscillator particle probability density and the classical prediction for $n=9, 49$, and 99 . Show how the classical prediction gets better as n increases. (Use $\omega=1\text{e}15$ rad/sec.)
2. Griffiths 2nd ed. problems 2.14 and 2.15 (Hint for 2.14: the wavefunction is no longer an eigenfunction of the Hamiltonian!)